THE BRANCHING ORIGINS HYPOTHESIS

A Thought Experiment Inspired by Modern Cosmology

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Concept illustration: AI-assisted scientific visualization

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Abstract

Modern cosmology attempts to explain how our universe began, yet many questions remain unanswered. This paper presents the Branching Origins Hypothesis, a speculative conceptual model developed by Liam Jones through discussions with his uncle Robert Rainer and exploration using artificial intelligence. The hypothesis suggests that instead of one universe emerging from a single primordial state, reality may have undergone repeated branching events, producing many independent universes through successive divisions. The model is compared against eternal inflation, symmetry breaking, particle cascades, and string theory, and is evaluated against the scientific standard of falsifiability. While speculative and lacking a mathematical framework, the work illustrates scientific curiosity, hypothesis formation, and critical evaluation — including a sustained discussion, carried out largely in the primary author's own words, of what separates a good scientific explanation from a merely satisfying one.

1. Introduction

The project began with a deceptively simple question: what if there were multiple singularities at the beginning of the universe, all descended from one original singularity that “exploded” into many, which then exploded into still more, eventually forming a large collection of separate universes — a multiverse? A related early version of the idea proposed that this same chain-reaction process, repeated at smaller and smaller scales, might explain the origin of the fundamental strings proposed in string theory.

This second part — particles cascading directly into strings — was set aside for this paper. String theory proposes that strings are more fundamental than particles, not something particles decay or explode into, so the mechanics did not hold up under review. The remainder of this paper focuses on the first and stronger part of the idea: a single origin branching into a multiverse. Through the conversations that followed, the original idea evolved from explosions into a branching model analogous to a bucket of water repeatedly dividing into smaller buckets. The resulting framework was compared against eternal inflation, symmetry breaking, particle cascades, and string theory, while also examining the scientific requirements of falsifiability and mathematical rigor.

2. The Hypothesis, in Three Versions

2.1 First version: the explosion chain

The initial picture was a literal chain reaction: one singularity explodes, producing several new singularities, each of which explodes again, and so on, with each explosion directly triggering the next — similar to a line of firecrackers.

2.2 Second version: bubbles in a boiling pot

On review, the explosion-chain picture was replaced with an analogy closer to how real cosmological models describe this process: not a triggered chain, but bubbles forming independently within a still-expanding medium, the way pockets of steam form throughout a pot of water approaching boiling, rather than one bubble causing the next.

2.3 Third version: pool → buckets → tinier buckets → cups

The hypothesis was then restated a final time: a pool of water divides into many buckets, each bucket divides into several tinier buckets, and each of those divides again into cups, continuing indefinitely at shrinking scale. This version removed the causal chain-reaction problem entirely and replaced it with parallel division at successive scales — which turns out to closely resemble two processes that are well established in physics (Section 4).

3. Figure 1: The Branching Origins Hypothesis

The figure below is a concept illustration produced with an AI image-generation tool, summarizing the hypothesis, comparing it to existing frameworks (Big Bang, eternal inflation, string theory), and listing open questions a physicist would ask before taking the idea further.

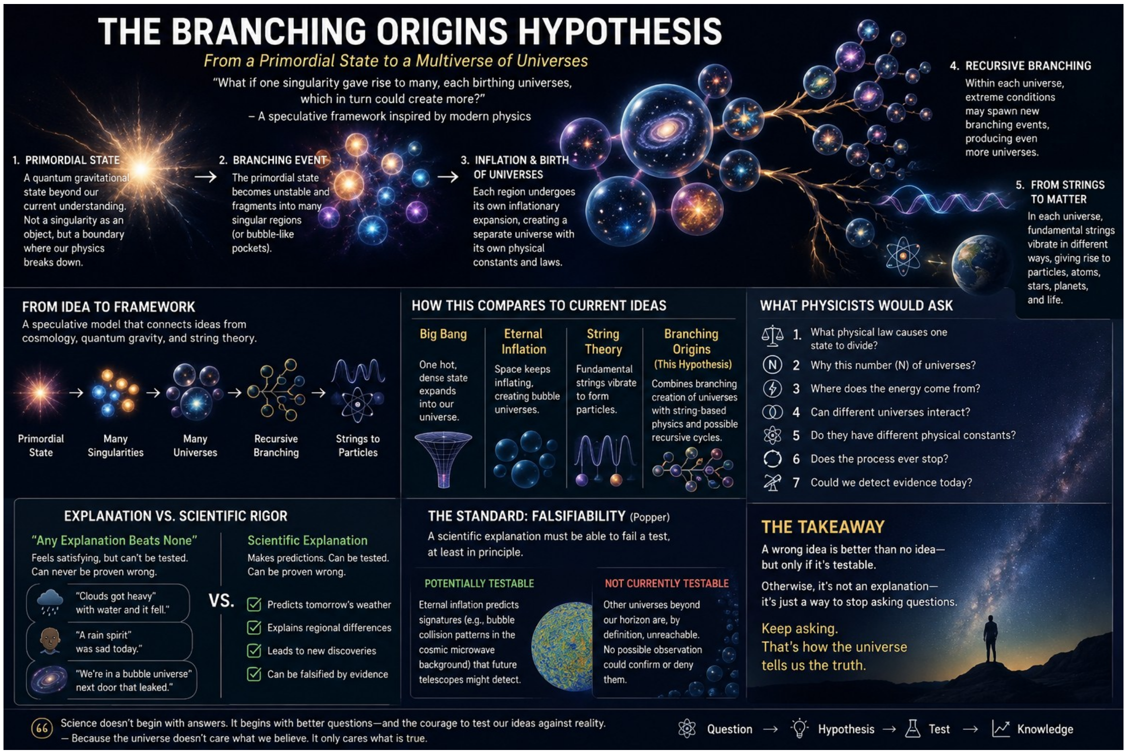

Figure 1. Summary infographic of the Branching Origins Hypothesis, generated as a concept aid for this project.

4. Connecting to Established Physics

4.1 Eternal (chaotic) inflation

The core structure of the hypothesis — one process giving rise to many separate universe-like regions — closely resembles eternal inflation, a serious extension of Big Bang cosmology developed by Alan Guth and Andrei Linde. In this model, the early universe underwent an extremely fast expansion of space itself (inflation), and in most regions this inflation never fully stops. Instead, pockets randomly stop inflating and settle into calmer, ordinary universes, similar to bubbles forming in boiling water. Each pocket becomes causally separate from the others. This is the closest real-physics counterpart to the hypothesis, and is the reason the second and third versions of the idea (Sections 2.2–2.3) are considered stronger than the first.

4.2 Symmetry breaking and particle showers

The final "pool → buckets → cups" version also has a strong match within a single universe, rather than across many. Immediately after the Big Bang, physicists believe the four fundamental forces (gravity, electromagnetism, the strong nuclear force, and the weak nuclear force) were unified as one force, which split into separate forces as the universe cooled — a process called symmetry breaking. The last of these splits, between electromagnetism and the weak force, has been confirmed experimentally. Separately, high-energy particle collisions at facilities such as the Large Hadron Collider produce literal cascades: one high-energy particle splitting into several, each of which splits again, producing a spray of hundreds of lower-energy particles. This is called a particle shower, and it is directly recorded by particle detectors on a daily basis.

5. Where the Hypothesis Diverges from Convention

- “Singularity” is a mathematical term describing where general relativity's equations break down (predicting infinite density or curvature), not a physical object capable of exploding. Any description of a singularity's behavior is necessarily speculative, since our best current theory gives no reliable answer there.
- Atoms are a late arrival in cosmic history (forming roughly 380,000 years after the Big Bang) and are not present at, or produced by, the earliest moments described in the hypothesis.
- In string theory, strings are proposed to be more fundamental than particles — particles are described as vibrational modes of strings — rather than products of particles exploding or decaying.
- Separate bubble universes, if they exist, are receding from one another faster than light can travel between them. This is not a limitation of current instruments; it means no observation of another bubble universe is possible even in principle.

6. The Central Philosophical Debate

A significant part of this project was a discussion about what makes an explanation scientific, prompted directly by challenges raised by the primary author.

6.1 “If the math supports it, isn't that enough proof?”

> *“It's like if you were trying to find out 2+2=4 — you don't have to write an essay about it, or count in your head.” — Liam Jones*

Mathematics is a closed, self-consistent system: once its starting rules are accepted, its conclusions follow automatically and require no outside check. Physical theories are a different kind of claim — they must also match the one specific universe we actually live in. It is possible to construct mathematically valid, internally consistent theories that do not describe our universe (for example, Newtonian gravity is mathematically consistent but measurably wrong near very strong gravitational fields, corrected later by general relativity). A theory only becomes a confirmed fact about our universe once a prediction unique to it has been checked against observation — as happened with light bending around the sun in 1919, confirming general relativity, and with the measured pattern of the cosmic microwave background, supporting inflation.

6.2 “Isn't having some explanation better than none at all?”

This question was addressed in two stages. First: an explanation that can never be tested or shown wrong does not function as an explanation in the scientific sense, because it cannot be distinguished from any number of equally “satisfying” but incompatible alternative stories. Second, on further challenge, the answer was refined: a proposed explanation — even one that later turns out to be wrong — is genuinely useful in science, provided it is testable and its proponents are willing to abandon it when evidence contradicts it. Historical examples include the geocentric model of the solar system (wrong, but useful and testable for centuries) and phlogiston theory (wrong, but its specific failures led directly to the discovery of oxygen and modern combustion chemistry).

6.3 The falsifiability standard

The resolving principle, drawn from philosopher of science Karl Popper, is that a scientific explanation must be falsifiable: there must exist some possible observation that could prove it wrong, even if that observation has not yet been made. Eternal inflation partly clears this bar — it predicts specific patterns (such as bubble-collision signatures in the cosmic microwave background) that future instruments might detect. The existence of other, causally disconnected bubble universes does not clear this bar, since no observation of them is possible even in principle.

7. Figure 2: Testable vs. Untestable Cascades

To make the distinction concrete, the same branching structure was drawn twice: once representing hypothetical bubble universes, and once representing a real, measured particle shower. The two diagrams are structurally identical, which is precisely the point — the difference between them is not visual, but empirical.

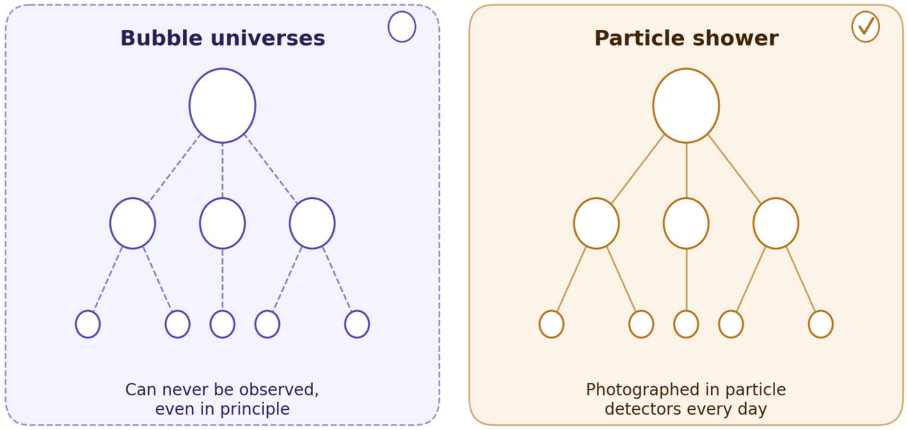

Figure 2. Identical branching structure, applied to an untestable hypothesis (left) and a routinely measured physical process (right).

8. Discussion

During the discussions, several important refinements emerged. Singularities are not understood as physical objects that explode, but rather as locations where current theories cease to be valid — a distinction that motivated the revision documented in Sections 2.1–2.2. Replacing explosions with recursive branching produced a conceptual model more closely resembling physical processes such as symmetry breaking and particle showers (Section 4). The authors also explored an important philosophical question: whether having an explanatory hypothesis is better than having none. The conclusion, reached across the exchange in Section 6, was that hypotheses are valuable because they can guide investigation and be refined by evidence — provided they remain open to testing and revision, and provided their advocates are willing to let them go when the evidence says no.

9. Conclusion

The Branching Origins Hypothesis is presented as a thought experiment rather than an established scientific theory. In its refined form, it is nonetheless a legitimate entry point into real cosmology: its structural intuition matches eternal inflation and, within a single universe, symmetry breaking and particle showers. Its weakest point is also its most central claim — that many separate, causally disconnected universes exist — which is not currently falsifiable and therefore sits outside what can presently be called established science, regardless of how consistent its supporting mathematics may be.

Regardless of whether the hypothesis is ultimately correct, its primary contribution is demonstrating how curiosity, critical discussion, mathematics, and evidence work together in the scientific method — and how an idea is formed, challenged, and refined. The project's working takeaway, arrived at jointly:

> *A wrong idea is better than no idea — but only if it's testable. Otherwise, it isn't an explanation. It's just a way to stop asking questions.*

Acknowledgments

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Further Reading

- Brian Greene, The Elegant Universe — accessible introduction to string theory.
- Alan Guth, The Inflationary Universe — written by the physicist who originated inflation theory.
- Karl Popper, The Logic of Scientific Discovery — origin of the falsifiability standard discussed in Section 6.3.